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ESTIMATION OF SECOND-STAGE DROPOUT RATES FOR STUDENT-TEACHER POPULATION GROWTH MODEL (DYNAMOD II).

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THE METHODOLOGY USED TO DETERMINE THE DROPOUT RATES FOR DYNAMOD II, A COMPUTERIZED MARKOV-CHAIN MODEL OF STUDENT AND TEACHER FLOWS OVER TIME, IS PRESENTED IN FIVE STEPS--(1) CALCULATING A DROPOUT RATE FOR MALE AND FEMALE ELEMENTARY STUDENTS AND FOR MALE AND FEMALE SECONDARY STUDENTS, (2) CALCULATING AN OVERALL RATE FOR MALES AND AN OVERALL RATE FOR FEMALES, (3) DETERMINING A PERCENT DISTRIBUTION OF DROPOUTS BY AGE, SEX, AND SCHOOL LEVEL, (4) SEPARATING THESE GROUPS INTO WHITE-NONWHITE COMPONENTS, AND (5) DIVIDING THE NUMBER OF DROPOUTS IN EACH CATEGORY BY THE NUMBER OF STUDENTS IN EACH CORRESPONDING CATEGORY TO OBTAIN THE FINAL DROPOUT RATES. (HW)

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NATIONAL CENTER FOR EDUCATIONAL STATISTICS
Division of Operations Analysis

ESTIMATION OF SECOND-STAGE DROPOUT RATES FOR STUDENT-TEACHER POPULATION GROWTH MODEL (DYNAMOD II)

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ESTIMATION OF SECOND-STAGE DROPOUT RATES FOR DYNAMOD II

This note presents the methodology used to determine the dropout rates for DYNAMOD II, a computerized Markov-chain model of student and teacher flows over time. This model is described in detail in another note.[1/] Dropout rates were estimated for elementary and secondary students by age group for each of four sex-race groups: white males, nonwhite males, white females, and nonwhite females. The methodology described below was in large part dicatated by the availability of data.

Step 1. The estimation procedures first involved calculating a dropout rate for each of the following four groups: male and female elementary students ($DO_{ES,M}$, $DO_{ES,F}$) and male and female secondary students ($DO_{SS,M}$,$DO_{SS,F}$). The procedures presented in another note were used for these initial calculations.[2/]

Step 2. Next the elementary and secondary dropout rates mentioned above were combined into two rates, using the appropriate weighting factors to obtain an over-all dropout rate for males (DO_M) and one for females (DO_F). Specifically,

$$DO_M = \frac{1}{(M_{ES} + M_{SS})} \left[(M_{ES})\ (DO_{ES,M}) + (M_{SS})\ (DO_{SS,M})\right]$$

$$DO_F = \frac{1}{(F_{ES} + F_{SS})} \left[(F_{ES})\ (DO_{ES,F}) + (F_{SS})\ (DO_{SS,F})\right]$$

1/ Edward K. Zabrowski, et.al., Student-Teacher Population Growth Model: DYNAMOD II, Technical Note Number 34, Division of Operations Analysis, National Center for Educational Statistics, Office of Education, May, 1967

2/ Edward K. Zabrowski and John T. Hudman, Dropout and Retention Rate Methodology Used to Estimate First-Stage Elements of the Transition Probability Matrices for DYNAMOD II, Technical Note No. 28, Division of Operations Analysis, National Center for Educational Statistics, Office of Education, April, 1967

where M_{ES} = the number of male elementary students in 1960,

M_{SS} = the number of male secondary students in 1960,

F_{ES} = the number of female elementary students in 1960,

and F_{SS} = the number of female secondary students in 1960.

The source of these weighting factors was the input to DYNAMOD II taken from the Bureau of the Census 1/1,000 sample of the 1960 census. It was not mathematically necessary to follow this weighting procedure in order to apply the percent distribution described in step 3. The distribution could have been applied to the number of dropouts for elementary and secondary schools separately. However, the dropout rates mentioned in step 1 are estimates based on several different sources, some more reliable than others. By combining the four rates into two, it was believed that the validity of the combined dropout rate was increased. These two estimates (DO_M and DO_F) were then applied to the 1960 school population yielding total number of male and female dropouts. The 1960 data were used because that was the base year for DYNAMOD II.

Step 3. The most useful dropout data, for our purposes, were found in a study done by the Bureau of Labor Statistics.[3/] Using this data, it was possible to determine a percent distribution of dropouts by age, sex, and school level (elementary and secondary). This

3/ Vera C. Perrella and Forrest A. Bogan, "Out-of-School Youth, February 1963," Special Labor Force Report No. 46, Monthly Labor Review, November, 1964.

distribution is shown in table 1. The row marginals indicate distribution by age, and the column marginals show the distribution by school level.

Step 4. The next step involved separating each cell in table 1 into white-nonwhite components. The data in the Bureau of Labor Statistics study just cited permitted calculation of the proportion of dropouts who were white and nonwhite by age and sex only. Thus it was necessary to assume that these proportions were constant over school level. Using this assumption, the 12 cells in table 1 were split into 24 cells giving an expanded percent distribution of dropouts by age, sex, race, and school level.

Step 5. Finally, the percent distributions described in step 4 for males and females were applied to the number of male and female dropouts, respectively (from step 2). This operation yielded the number of dropouts by age, sex, race, and school level. At this point it remained only to divide the number of dropouts in each category by the number of students in each corresponding category to obtain the final dropout rates. These rates are presented in table 2.

In conclusion it should be emphasized that the estimates resulting from the procedures just described are initial estimates only. When these estimates were converted to transition probabilities for DYNAMOD II they were then subjected to the same calibration procedures as the other probabilities in the model.

Table 1.-Percent distribution of male and female dropouts by age, sex, and school level

Age	Male			Female		
	Total	Elementary school	Secondary school	Total	Elementary school	Secondary school
Less than 15	10.09	6.55	3.54	15.08	8.61	6.47
15 - 19	84.41	17.80	66.61	83.12	11.27	71.85
20 and over	5.50	---	5.50	1.80	---	1.80
Total	100.00	24.35	75.65	100.00	19.88	80.12

Table 2.-Dropout rates used in DYNAMOD II, by age, sex, race, and school level

	MALE			
	White		Nonwhite	
Age 1/	Elementary school	Secondary school	Elementary school	Secondary school
Less than 15	.0024	.0256	.0063	.0967
15 - 19	.3038	.1148	.1707	.1930
20 - 24	---	.1214	---	.1205
25 - 44	---	.1214	---	.1205

	FEMALE			
	White		Nonwhite	
Age	Elementary school	Secondary school	Elementary school	Secondary school
Less than 15	.0033	.0439	.0069	.0952
15 - 19	.3265	.1309	.1346	.1567
20 - 24	---	.0429	---	.0705
25 - 44	---	.0429	---	.0705

1/ Dropout rates for the DYNAMOD II categories 20-24 years old and 25-44 years old were assumed to be equal because the data source reported dropout information only for the age category 20 years and over.